

REMARKS

Claims 10-13 and 15-36 were previously pending. Claim 31 is currently canceled. As a result, claims 10-13, 15-30, and 32-36 are pending for examination with claims 10, 20, 22, and 27 being independent claims. No new matter has been added.

I. Claim Objections

Applicant respectfully disagrees that dependent claim 13 does not further limit the subject matter of independent claim 10. Independent claim 10 recites in part “each of the at least one open-ended tubes having at least one of the at least one membrane modules mounted therein.” This element of independent claim 10 does not limit independent claim 10 to a filtration arrangement wherein “each of the at least one membrane modules is mounted in a corresponding open-ended tube” as recited in dependent claim 13.

Without acceding to the correctness of the basis for the objection to dependent claim 31, to advance prosecution, this claim has been canceled.

Accordingly, withdrawal of the objections to dependent claims 13 and 31 is respectfully requested.

II. Rejections Under 35 U.S.C. § 103

Claims 10-13 and 15-36 were rejected under 35 U.S.C. § 103(a) over Horii, JP 10076264A (hereinafter “Horii”) in view of Cote et al., U.S. Patent No. 5,607,593 (hereinafter “Cote”) and further in view of Ide, JP 2277528 (hereinafter “Ide”).

No *prima facie* case of obviousness of claims 10-13 or 15-36 over Horii in view of Cote and further in view of Ide can be made. The asserted combination of Horii with Cote and Ide cannot disclose or suggest each and every element of any of claims 10-13 or 15-36. Further, Horii, Cote, and Ide could not have been validly combined *ab initio*.

A. Ide teaches that it would be undesirable to operate a membrane filtration apparatus to displace liquid from within an aeration hood shrouding membrane fibers.

The Examiner acknowledges that Horii in view of Cote fails to disclose or suggest an “aeration hood configured and arranged such that a gas fed into the aeration hood will

displace feed liquid and lower a level of feed liquid in the aeration hood” as recited in independent claims 10 and 20. (Office Action at paragraph 17.) The Examiner asserts that Ide discloses that this element is inherently carried out in the apparatus of Ide. (Office Action at paragraph 18.) The Examiner further asserts that the element of “lowering a liquid level in the aeration hood by displacing feed liquid within the aeration hood with a gas” recited in independent claim 22 is inherently performed in the apparatus of Ide. (Office Action at paragraph 49.) These assertions reflect a misreading of Ide. Ide discloses the exact opposite of what the Examiner asserts; that these claim elements are not inherent in the structure described in Ide. Ide, in fact, teaches that it would be undesirable to incorporate these elements of claims 10, 20, and 22 into membrane filtration systems.

Ide discloses that prior systems, in which a level of liquid in a filtration vessel is lowered during membrane cleaning, exhibit numerous disadvantages, which it purported to overcome. For example, Ide discloses that in such prior systems, “there occurs such a problem that exposure of hollow yarn membrane to air becomes a cause for deterioration of the hollow yarn membrane” and “adhering again the particles to the hollow yarn membranes also occurs.” (Ide translation at page 4, lines 10-15.) Ide further discloses that in prior membrane filtration systems in which a liquid level about the membranes is lowered during aeration “the effect of vibrating the hollow yarn membranes by air is reduced by half and a phenomenon of keeping separated fine particles in the protecting tube and adhering again the particles to the hollow yarn membrane also occurs.” (Ide translation at page 4, lines 8-13.) Ide thus characterizes prior membrane filtration systems which allow a level of liquid surrounding the membranes to be lowered during cleaning as problematic; they provide for the undesirable results of deterioration and poor cleaning of the membranes.

Ide discloses that the membrane filtration apparatus that is allegedly the subject of his invention avoids the aforementioned problems by not lowering the level of liquid surrounding membrane fibers during cleaning. For example, Ide discloses that “[t]he present invention is carried out for solving the aforementioned problem [by] prevent[ing] the lowering of liquid level” (Ide translation at page 4, line 21 - page 5, line 1.) Ide alleges that in his invention “[t]he relation with the filter water level h_1 during bubbling

becomes $h_1=h_2$.” (Ide translation at page 6, lines 14-15; page 9, line 6.) As can be seen in Ide FIGS. 1 and 4, the height h_2 is above the upper wall 3 of what the Examiner characterizes as Ide’s aeration hood. Thus, during introduction of air into the device of Ide, the liquid level in what the Examiner characterizes as an aeration hood does not drop. Ide further discloses that in his invention “an air pump state” in which the membranes are completely covered with liquid (see FIG. 2) “is always maintained so that the whole reverse washing time is effectively used and the reverse washing efficiency is improved.” (Ide translation at page 8, lines 11-12, emphasis added.) Ide contrasts his filtration apparatus with other systems in which “the air pump state disappears so that washing of the adhesion root part of the hollow yarn membranes 2 stops and the adhered impurities separated from the hollow yarn membrane 2 stay in the protecting tube 4, causing re-adhesion to the hollow yarn membrane 2.” (Ide translation at page 7, lines 12-14.)

Thus, Ide does not disclose that it is inherent that an “aeration hood configured and arranged such that a gas fed into the aeration hood will displace feed liquid and lower a level of feed liquid in the aeration hood,” as is asserted by the Examiner. Rather, Ide discloses an invention where the lowering of the liquid level in a tube (formed of upper wall 3 and sidewalls 4) surrounding filtration membranes does not occur upon introduction of aeration bubbles into said tube. Ide discloses that lowering of the liquid level in such an apparatus during aeration would provide for undesirable effects which one of ordinary skill in the art would seek to avoid.

Thus, while filtration systems in which a level of a liquid surrounding membrane fibers is lowered during cleaning are discussed in Ide, Ide discloses that these systems suffer from several disadvantages which one of ordinary skill in the art would seek to avoid. Ide asserts that his system avoids these disadvantages of these prior filtration systems by not lowering a level of liquid surrounding membrane fibers during cleaning.

The invention claimed in the present application also overcomes the disadvantages of prior systems disclosed in Ide. Due to the unique design of the claimed invention, during membrane cleaning, air may be displaced from within the aeration hood, and a liquid level within said hood lowered, while the membrane fibers remain submerged in liquid.

B. Horii would not have been modified by one of skill in the art to include an aeration hood as claimed

There would be have been no motivation for one of ordinary skill in the art to have modified Horii in view of Ide or any other known reference to include an aeration hood “configured and arranged such that a gas fed into the aeration hood will displace feed liquid and lower a level of feed liquid in the aeration hood” as recited in independent claims 10 and 20. Nor would there have been any motivation for one of ordinary skill in the art to have modified Horii in view of Ide or any other known reference to provide for “lowering a liquid level in the aeration hood by displacing feed liquid within the aeration hood with a gas” as recited in independent claim 22. As discussed above, Ide teaches that there are several disadvantages that would dissuade one of ordinary skill in the art from constructing a filtration apparatus including an aeration hood in which a liquid level would drop upon the introduction of air.

Further, as discussed in Applicant’s previous response¹, if the header 16 of the “upflow way 4” of Horii (which the Examiner equates with an upper wall of an aeration hood) were somehow modified so as to form an aeration hood as recited in independent claims 10 and 20, this would render the filtration apparatus of Horii inoperable for its intended purpose. If gas fed into the “upflow way 4” would displace feed liquid and lower a level of feed liquid therein, then the header 16 of the “upflow way 4” would also prevent the flow of liquid or gas therethrough. If the device of Horii were modified in the manner suggested by the Examiner, the device would be incapable of circulating fluid from the “upflow way 4” to the “countercurrent way 5.” Any bubbles entering Horii’s alleged aeration hood would remain trapped there and prevent liquid to be filtered from reaching the membrane modules, thus rendering the filtration assembly of Horii inoperable for filtering the liquid. This would be true even if the “upflow way 4” and the “countercurrent way 5” were to be rearranged or reshaped to provide for upward flow through cylindrical channels and downward flow through rectangular or fan-shaped channels as suggested by the Examiner. (Office Action at page 34.) As such, one of ordinary skill in the art would not have been motivated to have modified Horii to include

¹ Applicant’s Response filed October 21, 2009.

an aeration hood as recited in any of independent claims 10, 20, or 22 or the claims that depend from these claims. See McGinley v. Franklin Sports, Inc., 262 F.3d 1339, 1354 (Fed. Cir. 2001) (“If references taken in combination would produce a ‘seemingly inoperative device,’ we have held that such references teach away from the combination and thus cannot serve as predicates for a *prima facie* case of obviousness.”)

In contrast to the Examiner’s asserted modified version of the device disclosed by Horii, the unique design of the presently claimed invention provides for the filtration of liquid through membranes enclosed within an aeration hood from which liquid may be displaced by the introduction of air.

C. The sleeves or open-ended tubes of claims 10-13 or 15-36 are not obvious in view of any alleged combination of Horii, Cote, and Ide

No combination of Horii with Cote and Ide could render obvious the sleeves or open-ended tubes recited in any of claims 10-13 or 15-36. For the reasons discussed in Applicant’s previous response², neither Cote nor Ide, alone or in combination, disclose or suggest open-ended tubes extending downwardly from the upper wall of an aeration hood as recited in independent claims 10 and 22 or “sealingly secured to the upper wall” of an aeration hood as recited in independent claim 27. Nor does Horii disclose any open-ended tube or sleeve within the filtration arrangements as recited in any of independent claims 10, 20, 22, or 27 or the claims that depend therefrom. The Examiner characterizes partitioning walls 3 of Horii as forming the sidewalls of an aeration hood and characterizes the same partitioning walls 3 as forming tubes in which Horii’s membrane modules are included. (Office Action at paragraphs 7 and 8.) If the same partitioning walls 3 of Horii form both a wall of an aeration hood and an “open-ended tube” as asserted by the Examiner, then Horii cannot disclose “the aeration hood comprising at least one open-ended tube distinct from any side wall of the aeration hood” as recited in independent claims 10 and 22, “an aeration hood positioned within the feed tank, distinct from the sleeve” as recited in independent claim 20, or “a tube distinct from any side wall of the aeration hood” as recited in independent claim 27.

² *Id.*

The Examiner asserts that Ide also discloses an open-ended tube or sleeve (protecting tube 4) distinct from any sidewall (trunk 6) of an aeration hood. (Office Action at pages 36-37.) This assertion, however, has already been acknowledged by the Examiner as being incorrect. As explained in the Applicant's previously filed response³, trunk 6 of Ide cannot be an aeration hood sidewall as alleged by the Examiner. Trunk 6 of Ide cannot be an aeration hood sidewall as claimed in any of independent claims 10, 20, 22, or 27 because it is not "positioned within a feed tank" as recited in independent claims 10 and 22, immersed in feed liquid, as recited in independent claim 22, or "submerged in water to be treated" as recited in independent claim 27. In paragraphs 26 and 27 of the Office Action mailed July 28, 2009, the Examiner acknowledged that the Applicant was correct that trunk 6 of Ide could not be an aeration hood sidewall as claimed in the present application.

The Examiner acknowledges that Horii fails to disclose aeration inlets in the walls of the tubes as recited in independent claims 10 and 22 or an aeration outlet in a sleeve as recited in independent claim 20. (Office Action at paragraphs 14, 24, and 35.) One of ordinary skill in the art would not have been motivated to have modified the apparatus of Horii to include aeration inlets in a wall of a tube or sleeve enclosing filtration membranes as allegedly disclosed in Cote, as asserted by the Examiner. (Office Action at paragraphs 14-16.) This is because doing so would have provided no benefit. The Examiner asserts that a motivation to combine the aeration inlets of the tubes of Cote with the apparatus of Horii can be found because "Cote et al. further discloses that this arrangement is used to promote circulatory flow within the tank." (Office Action at paragraph 16.) The structure of Horii, however, already provides for the circulation of fluid within the tank disclosed by introducing aerating gas from the diffuser 6 into the area including the membranes 15 formed between the outer wall of the immersion tub 1 and the bridgewalls 3 of the apparatus disclosed. (See paragraph [0015] and FIG. 1 of Horii.) In fact, one of ordinary skill in the art would have been dissuaded from incorporating the slots or aeration openings of the tubes of Cote into the apparatus of Horii (e.g., in bridgewalls 3). To have done so would have provided paths for aeration gas to escape the confined area within Horii's bridgewalls 3, resulting in aeration gas

³ Applicant's Response filed April 13, 2009.

being less well confined about the filtration membranes, thereby defeating a purpose of the bridgewalls 3 of Horii.

D. Horii, Cote, and Ide are not properly combinable *ab initio*

One of ordinary skill in the art would have been dissuaded from modifying Horii to include features of Cote and/or Ide in the manner asserted for the reasons outlined above. The Examiner appears to have used hindsight reasoning using knowledge gleaned from Applicant's disclosure as a roadmap to pick, choose, and combine various discreet elements of these three references. The Examiner has not provided a valid rationale as to why one of ordinary skill in the art would have modified Horii to include features of Cote or Ide in the manner asserted, and as such has not established that these references could have been validly combined. As noted above, the device of Horii could not function for its intended purpose if modified as suggested by the Examiner. Further, as also noted above, there is no benefit that would have motivated one of ordinary skill in the art to have modified the device of Horii to include the aeration inlets allegedly disclosed in Cote. A patent "composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." KSR Int'l Co. v. Teleflex Inc., 127 S. Ct. 1727, 1741 (2007). An obviousness determination requires identification of "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." Id. As acknowledged by the Examiner, the test for obviousness is what the combined teachings of the references would have suggested to those of ordinary skill in the art. (Office Action at page 35, citing In re Keller, 642 F.2d 413 (CCPA 1981).)

As none of Horii, Cote, or Ide disclose, teach, or suggest either an aeration hood or the sleeves or open-ended tubes recited in any of claims 10-13 or 15-36, the asserted combination of Horii, Cote, and Ide cannot disclose, teach, or suggest each claim element of any of claims 10-13 or 15-36. Further, one of ordinary skill in the art would not have been motivated to have combined these references *ab initio*. As such, none of claims 10-13 or 15-36 could be obvious over the asserted combination of Horii, Cote, and Ide.

E. Independent claims 20, 22, and 27 are patentable over Horii, Cote, and Ide for even additional reasons

Independent claim 20 is further patentable over the asserted combination of Horii, Cote, and Ide for at least an additional reason, which is not addressed in the Office Action. In addition to reciting the claim elements missing from Horii, Cote, and Ide discussed above, independent claim 20 recites, in pertinent part “[a] filtration arrangement comprising . . . an aeration hood . . . [including] at least one aeration opening in a wall of the aeration hood positioned adjacent to the open region [in a sleeve].” None of Horii, Cote, or Ide disclose or suggest any aeration hood including at least one aeration opening in a wall of the aeration hood constructed and arranged to direct a gas through the at least one aeration opening and into an interior of a sleeve surrounding a periphery of a membrane module. Thus, independent claim 20, and dependent claim 21, which depends therefrom, further patentably distinguish over the asserted combination of Horii, Cote, and Ide.

Further, the elements recited in independent claims 20, 22, and 27 of the sleeve (or open-ended tube) extending only partially along a length of a membrane module cannot be rendered obvious by the asserted combination of Horii, Cote, and Ide.

The Examiner asserts that Ide teaches that it is known in the art to extend a sleeve or tube partially along the length of a membrane module such that an open region is without a sleeve, or such that a portion of the lower end of the membrane module extends from the lower end of the tube. (Office Action at paragraphs 25, 26, and 36.) The Examiner further asserts that one of ordinary skill in the art would have been motivated to extend the sleeve (bridgewalls 3) of Horii partially along the length of the membrane in this manner because “this is an example of simple substitution of one known element (extend the sleeve along the length of the membrane module) for another (extend the sleeve partially along the length of the membrane module, such that the open region is without a sleeve) to obtain a predictable results (the air enters the module from its lower end, while the sleeve protects the membranes along most of their length).” (Office Action at paragraphs 26 and 36.)

Horii, however, already provides for air from diffusers 6 to enter the membrane modules from a lower end thereof and for a sleeve (bridgewalls 3) to protect the

membranes along their length. Thus, there would be no advantage to modify Horii according to Ide as suggested. An assertion that a modification could be made does not, by itself, establish that one of skill in the art would have been motivated to have made the modification (see citations to KSR above).

The Examiner has thus not established that there would have been any motivation to have made the asserted modification to Horii in view of Cote and/or Ide to render the elements of independent claims 20, 22, and 27 indicated above obvious.

Accordingly reconsideration and withdrawal of the rejection of claims 10-13 and 15-36 under 35 U.S.C. § 103 over Horii in view of Cote and further in view of Ide is respectfully requested.

CONCLUSION

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes that the application is not in condition for allowance, the Examiner is requested to call Applicant's attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762.
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